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# FOREST CONTROL

## by CONTINUOUS INVENTORY

"Today I have grown taller from walking  
with the trees."

...Karle Wilson

Milwaukee, Wis. March, 1963 No. 108

### THE PRINCIPAL PURPOSE OF INVENTORY

In the competitive world of business, more time is spent making frequently repeated, in and out inventories than you can shake a stick at. The reason for these repetitive inventories is to keep the shelves, and the bins, and the counters well filled with rapid turnover, high margin stock at all times. Business inventories are made at considerable expense to guarantee that there will also be considerable profit.

Business inventories are made annually, quarterly, monthly, and at Line Materials in Milwaukee, they are made daily for the entire far flung empire of the company. Data processing makes these frequent inventories possible without disrupting current work and responsibilities, and without hampering business opportunities.

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In the expanding world of forestry, forest managers are spending more and more time making frequently repeated, in and out forest inventories. The main purpose of these inventories is to keep all forest soils well stocked with rapid turnover, high margin growing stock at all times. Continuous forest inventories are made at considerable expense to guarantee that there will also be considerable and continuous profit and growth.

Continuous forest inventories are repeated at 3 to 10-year intervals. Ten thousand to 30,000 tree cards are handled by data processing methods for each inventory. All work is done by advance arrangement to avoid disrupting current management responsibilities and the technical duties of the foresters in charge. CFI, as with all inventories, must be done without impeding or encumbering business opportunities.

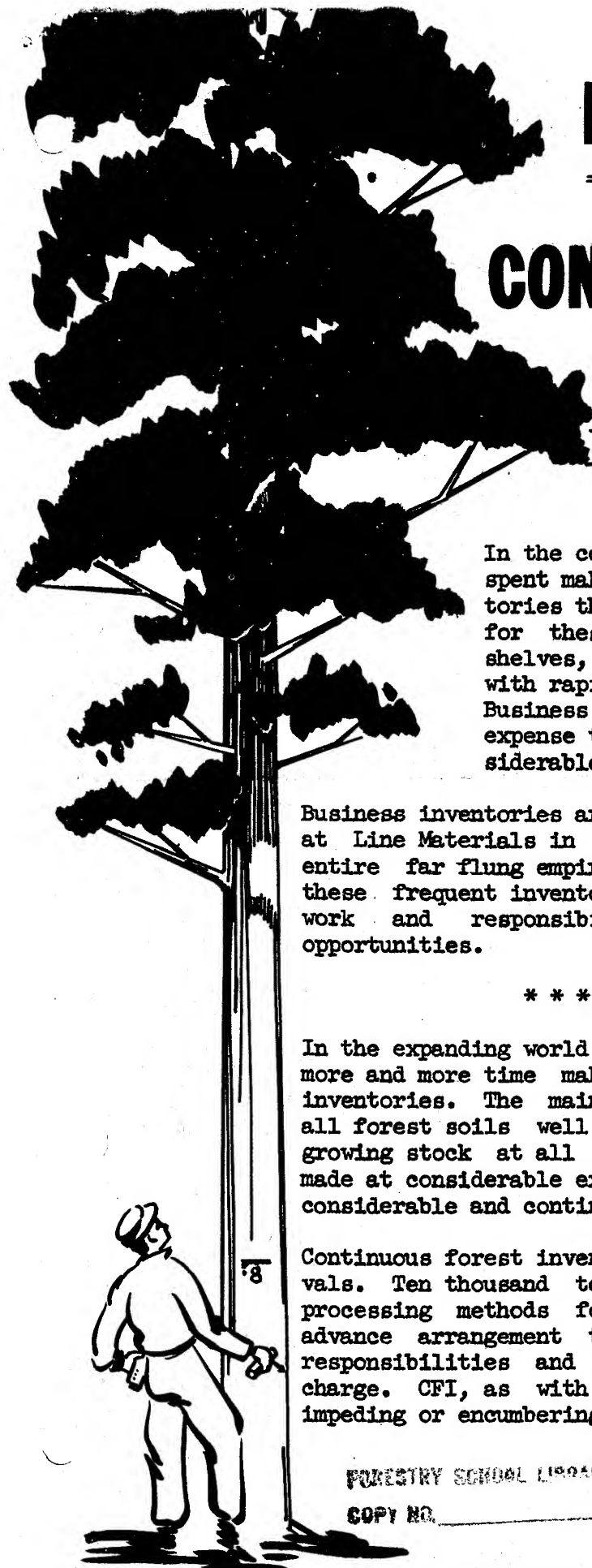
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*The Forester*



TREE VIGOR GRADING RULES COMMONLY USED IN CFI CASES  
NORTH CENTRAL REGION, NUMBER 9

Classification of the health or growth potential of forest trees is important to good forest management. Whether stands are marked for selective cutting or are clear cut, tree vigor grading is an important guiding influence.

Tree vigor grading is best done with a constant and repetitive system for this will save the greatest amount of time. But it does not take a great deal of time to grade tree vigor. When it is considered that only 2 to 4 minutes are needed to examine and record CFI information pertaining to the individual tree, it seems obvious that not much of this total time per tree could possibly be allotted to tree vigor classification alone. Actually, it takes only 20 to 30 seconds to flash grade tree vigor. This speed of accomplishment is due to a number of factors.

1. There is ample time to scan the crown and upper bole of trees as they are approached to make the more specific dimensional measurements.
2. Final vigor decisions are not made until species, DBH, soundness and usable length are weighed and recorded. Most of these tree characteristics help define vigor.
3. Many trees, because of vigor grade limitations on risk, rot, crown size, and bole form, require no special examination for vigor decisions. Trees of unusually good or poor health are often obvious at a glance.

The practice of tree vigor grading reduces the forester's tendency to appraise trees on the basis of size or quality of product. Orderly examination of the qualifications for sound wood growth in trees is a good habit to get into. It aids in the choice and marking of trees for selective and intermediate cuts. The constituent parts of tree growth help us weigh the condition of the whole forest.

We have passed through an era of broad, sweeping decisions and generalizations in forestry. Today we are much more specific in our forest accounting and management activities. This is due to the use of data processing and the assured recovery of comparative records through CFI systems. Interest in the component parts of growth, volume correlation studies and normal tree distribution patterns has also contributed to an interest in more refined tree classification. It makes sense to compile and compare the growth of sound wood by tree vigor classes.

The art of tree vigor grading must be learned. An orderly system is essential. The least accessible qualifications for tree growth are the first qualifications studied. These are crown class, crown size, leaf density and upper bole condition. Subsequently considered are length of bole, straightness, soundness, DBH, and root placement. Following this, one overall flash glance is sufficient to fix the tree vigor 90% of the time.

Preliminary diagnoses of tree vigor are best made in this order:

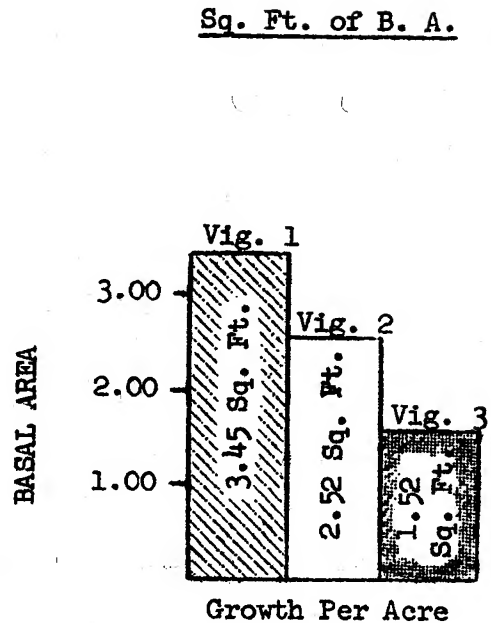
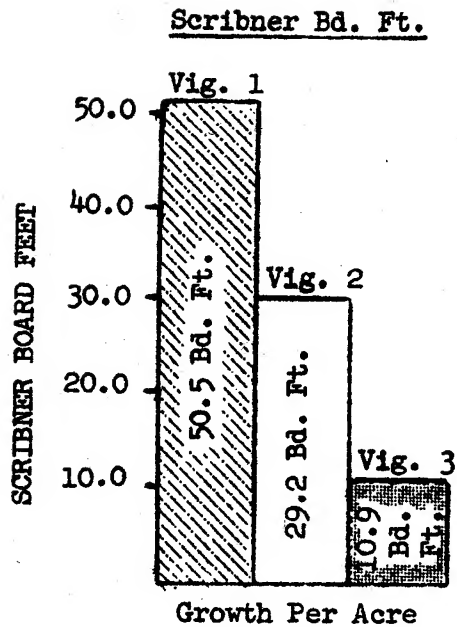
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|------------------|-----------------------------|
| 1. Crown class   | 4. Bole form and length     |
| 2. Crown size    | 5. Rot in the usable length |
| 3. Crown density | 6. Risk of mortality        |

Comparative results of tree vigor grading have significant value in forestry. To demonstrate this a series of results for 18 annual records has been compiled and is presented for review.

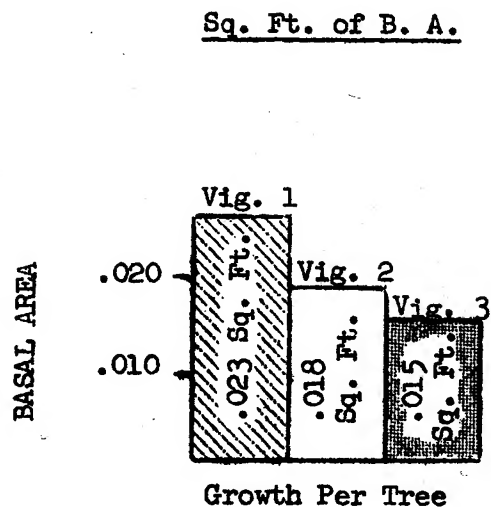
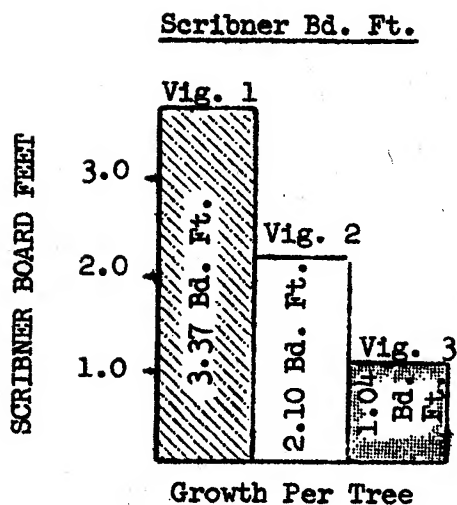
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EXAMINE THESE TREE VIGOR CORRELATIONS  
AND DRAW YOUR OWN CONCLUSIONS  
ON THE 17-YEAR VIGOR-GROWTH CORRELATION

FLASH VIGOR GRADE  
GROWTH PER ACRE PER YEAR  
Total Stand - All Species



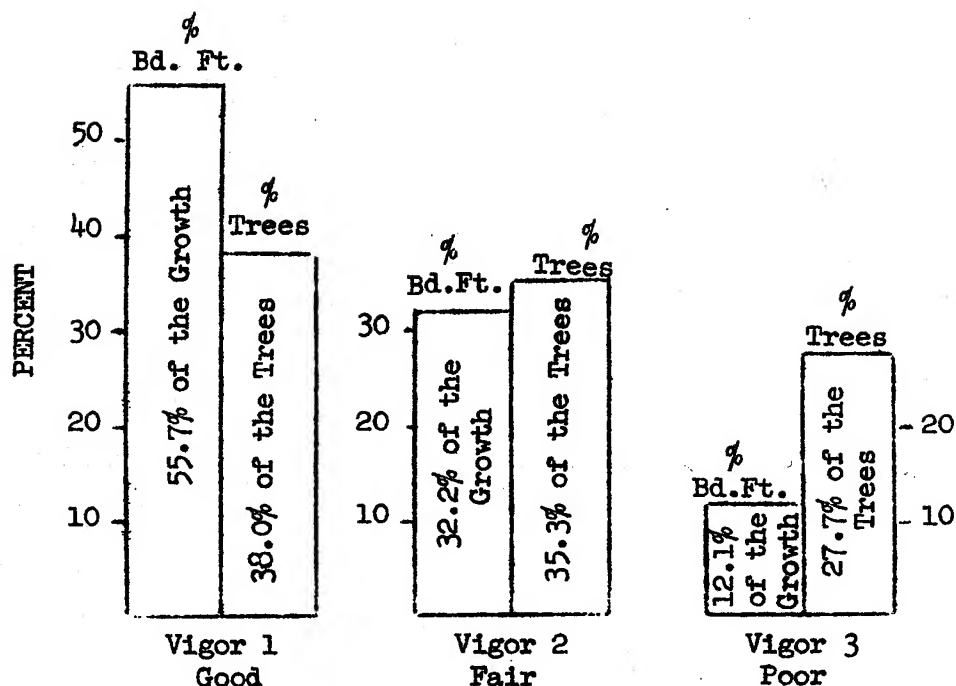
FLASH VIGOR GRADE  
GROWTH PER TREE PER YEAR



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VIGOR-GROWTH CORRELATIONS IN PERCENT  
SCRIBNER BOARD FEET AND NUMBER OF TREES

Total Stand - All Species



These charts are backed by 2,674 individual tree measurements taken over a 17-year period. An average of 157 trees were measured each year.

Tree vigor classes were judged and recorded 4 times during the period. The species are mixed oaks and northern hardwoods, all averaged together. All trees are sawlogs at each measurement period. (Repeaters or survivors).

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**SCRIBNER BOARD FOOT VIGOR-GROWTH CORRELATIONS ARE QUITE CONSISTENT  
IN TWO-YEAR INTERVALS**

A 14" DBH CLASS SAMPLE  
ALL SPECIES COMBINED

Meas. :	Good		Fair		Poor		TOTAL	
Period :	VIGOR 1		VIGOR 2		VIGOR 3			
	No. of	Bd. Ft.	No. of	Bd. Ft.	No. of	Bd. Ft.	No. of	Bd. Ft.
	Trees	:Per Tree	Trees	:Per Tree	Trees	:Per Tree	Trees	:Per Tree
1945								
1946	20	5.97	27	3.45	19	1.88	66	3.76
1947								
1948	21	2.83	28	1.80	18	1.20	67	1.96
1949								
1950	18	1.87	27	1.67	19	1.19	64	1.59
1951								
1952	23	3.52	27	2.21	20	0.02	70	2.01
1953								
1954	25	3.15	28	2.23	18	1.22	71	2.29
1955								
1956	26	2.68	24	2.47	28	-0.61	78	1.43
1957								
1958	32	3.53	21	2.81	30	0.68	83	2.32
1959								
1960	31	3.67	22	0.21	28	-0.36	81	1.34
1961								
1961	17	4.48	13	1.09	14	1.84	44	2.64
Totals	213		217		194		624	
Ave.	-	3.50	-	2.06	-	0.63	-	2.11

Usable length and soundness decisions in the woods sometimes introduce variables in board foot growth which cause some inconsistency in the resulting growth-vigor correlations. Over periods of time longer than one year, with sufficient trees these inconsistencies are eliminated or moderated.

BASAL AREA VIGOR-GROWTH CORRELATIONS ARE CONSISTENT  
IN TWO-YEAR INTERVALS

A 16" DBH CLASS SAMPLE  
 ALL SPECIES COMBINED

Meas.	Good VIGOR 1		Fair VIGOR		Poor VIGOR 3		TOTAL	
Period	No. of Trees	B. A. Per Tree	No. of Trees	B. A. Per Tree	No. of Trees	B. A. Per Tree	No. of Trees	B. A. Per Tree
1945								
1946	22	.0214	23	.0187	9	.0133	54	.0189
1947								
1948	22	.0145	22	.0136	14	.0093	58	.0129
1949								
1950	24	.0225	22	.0177	14	.0129	60	.0185
1951								
1952	20	.0210	21	.0195	16	.0169	57	.0193
1953								
1954	19	.0221	19	.0216	21	.0100	59	.0176
1955								
1956	19	.0174	22	.0127	22	.0127	63	.0141
1957								
1958	23	.0204	23	.0157	25	.0128	71	.0162
1959								
1960	22	.0191	24	.0183	20	.0135	66	.0171
1961	7	.0271	11	.0145	10	.0130	28	.0171
Totals	178	3.58	187	3.18	151	1.91	516	8.67
Ave.	-	.0201	-	.0170	-	.0126	-	.0168

The most reliable growth-vigor correlations result from the calculation of growth on a basal area basis. The chief variables involved with basal area are induced by the variability in diameter tape measurement, and the variation of the tree from the true cylinder.

TREE VIGOR GRADING RULES COMMONLY USED WITH CFI

TREE VIGOR QUALIFICATIONS	GOOD GROWING STOCK VIGOR 1	FAIR GROWING STOCK VIGOR 2	POOR GROWING STOCK VIGOR 3
CROWN CLASS	Head dominant. Dominant. Codominant.	Dominant. Codominant. High intermediate. Free to grow if overtopped.	Low intermediate. Suppressed. Suppressed trees not free to grow are always Vigor 3.
CROWN SIZE	In hardwoods, a full crown concentrically. In conifers, a good crown-length ratio.	In hardwoods, a 1/2 to 3/4 full crown concentrically. In conifers, a fair to good crown-length ratio.	In hardwoods, a crown less than half full concentrically. In conifers, a poor crown-length ratio.
CROWN DENSITY LEAF CONDITION	Good silhouette. Healthy leaf. Occasional dead branch in outer crown. Permits natural pruning.	Fair silhouette. Fair leaf condition. Some dead branches in outer crown. Large branch stubs on upper bole.	Poor silhouette. Leaves small; yellowing. Considerable die-back and many branch stubs on upper and middle bole.
BOLE LENGTH AND FORM	Usable length commensurate with site. DBH-length ratio good. No usable length stoppers.	Usable length fairly commensurate with site. DBH-length ratio fair to good. Usable length stoppers on upper bole.	Usable length far short of the average for the site. DBH-length ratio poor. Trees permanently sub- merchantable in length are always Vigor 3 or worse.
	Usable lengths far short of average for the site reduce tree vigor by one class		
ROT AND DECAY WITHIN THE USABLE LENGTH	Cull loss seldom more than 3% to 7%. Never exceeds 14%. Slight crook or sweep will cut out. Heart rot is negligible.	Cull loss often exceeds 14%; never more than 22%. Moderate crook or sweep will not fully cut out. Heart rot present in early stages.	Cull loss often 22%. Trees with a cull loss of 35% are always Vigor 3. Heavy crook or sweep which will not cut out. Serious heart rot present.
RISK OF MORTALITY IN NATURAL FORESTS OR IN STANDS AFTER MODERATE PARTIAL CUTS	No risk. Roots firm. Lower and upper bole sound. All large, high crotches strong. No windfall or main stem breakage anticipated.	Moderate risk. Roots firm. Moderate rot in lower trunk has no particular effect on risk of loss. Large, high crotches strong. Loss of tree not likely within 10 to 15 years.	Heavy risk. Root sprung. Large, high, weak crotches. Weak butter churn butts. Excessive die-back, epidemic disease or insect damage. Loss of tree likely within 5 to 10 years.
SPECIAL NOTE	Cull trees (Vigor 4) are less than 40% or 50% sound		
SPECIAL NOTE	Decisions on tree vigor must not be influenced by soil, site, topography, physical features, or other factors outside of the tree itself.		